State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
DIVISION OF FLOOD MANAGEMENT

Fact Sheet

Sacramento River Flood Control Project Weirs and Flood Relief Structures

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Flood Operations Branch

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Overview

There are ten overflow structures in the Sacramento River Flood Control Project (six weirs, three flood relief structures, and an emergency overflow roadway) that serve a similar function as pressure relief valves in a water supply system. Weirs are lowered sections of levees that allow flood flows in excess of the downstream channel capacity to escape into a bypass channel or basin.

All six weirs of the Project (Moulton, Colusa, Tisdale, Fremont, Sacramento, and Cache Creek) have: (1) a fixed-level, concrete overflow section; followed by (2) a concrete, energy-dissipating stilling basin; with (3) a rock and/or concrete erosion blanket across the channel beyond the stilling basin; and (4) a pair of training levees that define the weir-flow escape channel.

All overflow structures except the Sacramento Weir and other relief structures pass floodwaters by gravity once the river reaches the overflow water surface elevation. The Sacramento Weir has gates on top of the overflow section that hold back floodwaters until opened manually by the Department of Water Resource's Division of Flood Management.

Flood Relief Structures

Four other relief structures are concentrated along 18 river miles between Big Chico Creek (River Mile 194) and the upstream end of the left (east) bank levee of the Sacramento River Flood Control Project (near River Mile 176). These structures function in a similar manner as the weirs but are not called weirs because they do not have all four structural characteristics previously described. The area to the east of this 18-mile reach of river is known as the Butte Basin, a natural trough east of the river.

Three of the structures are designated as flood relief structures (M&T, 3B's, and Goose Lake). If these three fail as designed a raised 6,000-foot roadway near the south end of Parrott Ranch allows excess floodwaters to escape the Sacramento River to the Butte Basin before being confined by the downstream project levees.

Figure 1, Location Map for Weirs and Relief Structures in the Sacramento River Flood Control Project

Moulton Weir

Moulton Weir was completed in 1932. It is located along the easterly side (left bank looking downstream) of the Sacramento River approximately eight miles north of the town of Colusa, and about 100 miles north of Sacramento. Its primary function is to release overflow waters of the Sacramento River into the Butte Basin at such times when floods exceed the safe carrying capacity of the main channel of the Sacramento River downstream from the weir. The fixed crest reinforced concrete weir is 500 feet long with concrete abutments at each end. The outlet channel is flanked by training levees and is approximately 3,000 feet long. The project design capacity of the weir is 25,000 cubic feet per second (cfs)

Figure 2, Moulton Weir, January 1997

Colusa Weir and Bypass

Colusa Weir was completed in 1933. It is located along the easterly side (left bank) of the Sacramento River one mile north of the town of Colusa. Its primary function is to release overflow waters of the Sacramento River into the Butte Basin. The fixed crest reinforced concrete weir is 1,650 feet long and is flanked by training levees that connect the river to the basin. The project design capacity of the weir is 70,000 cfs.

Figure 3, Colusa Weir, March 1995

Tisdale Weir and Bypass

Tisdale weir was completed in 1932. It is located along the east levee (left bank) of the Sacramento River about ten miles southeast of the town of Meridian and about 56 miles north of Sacramento. Its primary purpose is to release overflow waters of the Sacramento River into the Sutter Bypass. The fixed crest reinforced concrete weir is 1,150 long. The four-mile leveed bypass channel connects the river to the bypass. The project design capacity of the weir is 38,000 cfs.

Figure 4, Tisdale Weir in Dry Conditions (flow direction is left to right)

Fremont Weir

Fremont Weir was completed in 1924. It is the first overflow structure on the river's west side (right bank), and its two-mile overall length marks the beginning of the Yolo Bypass. It is located about 15 miles northwest of Sacramento and eight miles northeast of Woodland. South of this latitude the Yolo Bypass conveys 80 percent of the system's floodwaters through Yolo and Solano Counties until it rejoins the Sacramento River a few miles upstream of Rio Vista. The weir's primary purpose is to release overflow waters of the Sacramento River, Sutter Bypass, and the Feather River into the Yolo Bypass. The project design capacity of the weir is 343,000 cfs.

Figure 5, Fremont Weir in Dry Conditions (flow direction is left to right)

Sacramento Weir and Bypass

The Sacramento Weir was completed in 1916. **It is the only weir "opened" or "closed" – all others overflow by gravity on their own.** It is located along the west levee (right bank) of the Sacramento River approximately 4 miles upstream of the Tower Bridge, and about 2 miles upstream from the mouth of the American River. Its primary purpose is to protect the City of Sacramento from excessive flood stages in the Sacramento River channel downstream of the American River. The weir limits flood stages (water surface elevations) in the Sacramento River to project design levels through the Sacramento/West Sacramento area. The project design capacity of the weir is 112,000 cfs.

It is 1,920 feet long and consists of 48 gates that divert Sacramento and American River floodwaters to the west down the mile-long Sacramento Bypass to the Yolo Bypass. Each gate has 38 vertical wooden plank "needles" (4 inches thick by 1-foot wide by 6 feet long), hinged at the bottom and retained at the top by a hollow metal beam. The beam is manually released using a latch. Flood forecasters provide the necessary predictive information to weir operators who manage the number of opened gates in order to control the river's water surface elevation.

The Department of Water Resources operates the weir according to regulations established by the U.S. Army Corps of Engineers. The opening and closing criteria have been optimized to balance two goals: (1) minimize sediment deposition due to decreased flow velocities in the river channel downstream from the weir to the mouth of American River; and (2) to limit the flooding of agricultural lands in the Yolo Bypass only until after they have been inundated by floodwaters over Fremont Weir.

Figure 5, Sacramento Weir with Yolo Bypass in Background, March 1995

Figure 6, Sacramento Weir with American River in background, March 1995 (30,000 cfs)

The weir gates are not opened until the river reaches 27.5 feet at the I Street gage with a forecast to continue rising. This gage is about 1,000 feet upstream from the I Street Bridge, and about 3,500 feet downstream from the mouth of the American River. The number of gates to be opened is determined by the NWS/DWR river forecasting team (until all are opened) to meet either of two criteria: (1) to prevent the stage at the I Street gage from exceeding 29 feet, or (2) to hold the stage at the downstream end of the weir to 27.5 feet. Once all 48 gates are open, Sacramento River stages from Verona to Freeport may continue to rise during a major flood event. Project design stages are 41.3 feet at Verona, 31.5 feet at the south end of the Sacramento Weir, and 31 feet at the I Street gage.

During a major flood opening the weir gates at river stages below 27.5 feet would not reduce ultimate peak flood stages in the Sacramento River from Verona to Freeport. Diversion of the majority of Sacramento River, Sutter Bypass, and Feather River floodwaters to the Yolo Bypass from Fremont Weir controls Sacramento River flood stages at Verona. Because the design flood capacity of the American River (115,000 cfs) is 5,000 cfs higher than that of the Sacramento River channel past downtown Sacramento the Sacramento Weir is a critical component of the project to keep flood control project runoff at safe water levels. Because flood flows from the American River channel during a major flood event often exceed the flood-carrying capacity of the Sacramento River channel past downtown Sacramento, floodwaters flow upstream from the mouth of the American River to the Sacramento Weir.

The weir gates are closed as rapidly as practicable once the stage at the weir drops below 25 feet. This provides "flushing" flows to re-suspend sediment deposited in the Sacramento River between the Sacramento Weir and the American River during the low velocity flow periods in that reach when the weir is open during the peak of the flood event.

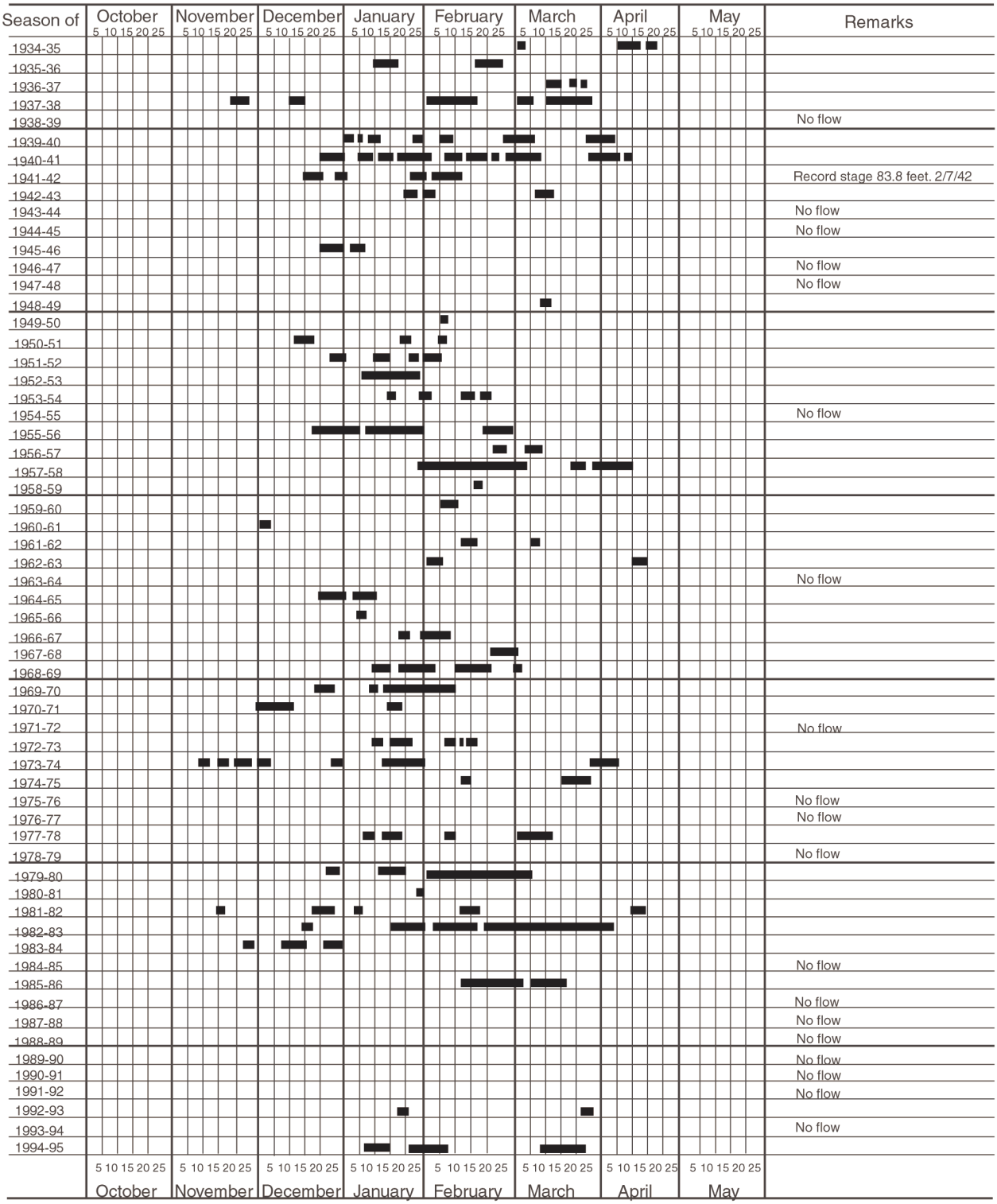
Cache Creek Settling Basin and Weir

The Cache Creek Settling Basin and Weir were originally completed between the late 1930's through the early 1950's. The basin was expanded and new weir was completed in 1991. It is located in Yolo County about two miles east of the City of Woodland. Its primary purpose is to preserve the floodway capacity of the Yolo Bypass by entrapping the heavy sediment load carried by Cache Creek. The basin is bound by levees on all sides and covers approximately 3,600 acres. The roller compacted concrete weir is 1,740 feet long along the east levee of the basin and controls discharge to the bypass. The project design capacity of the weir is 30,000 cfs, which is also the maximum capacity of the upstream Cache Creek channel system.

Figure 7, Cache Creek Settling Basin Weir, March 1995

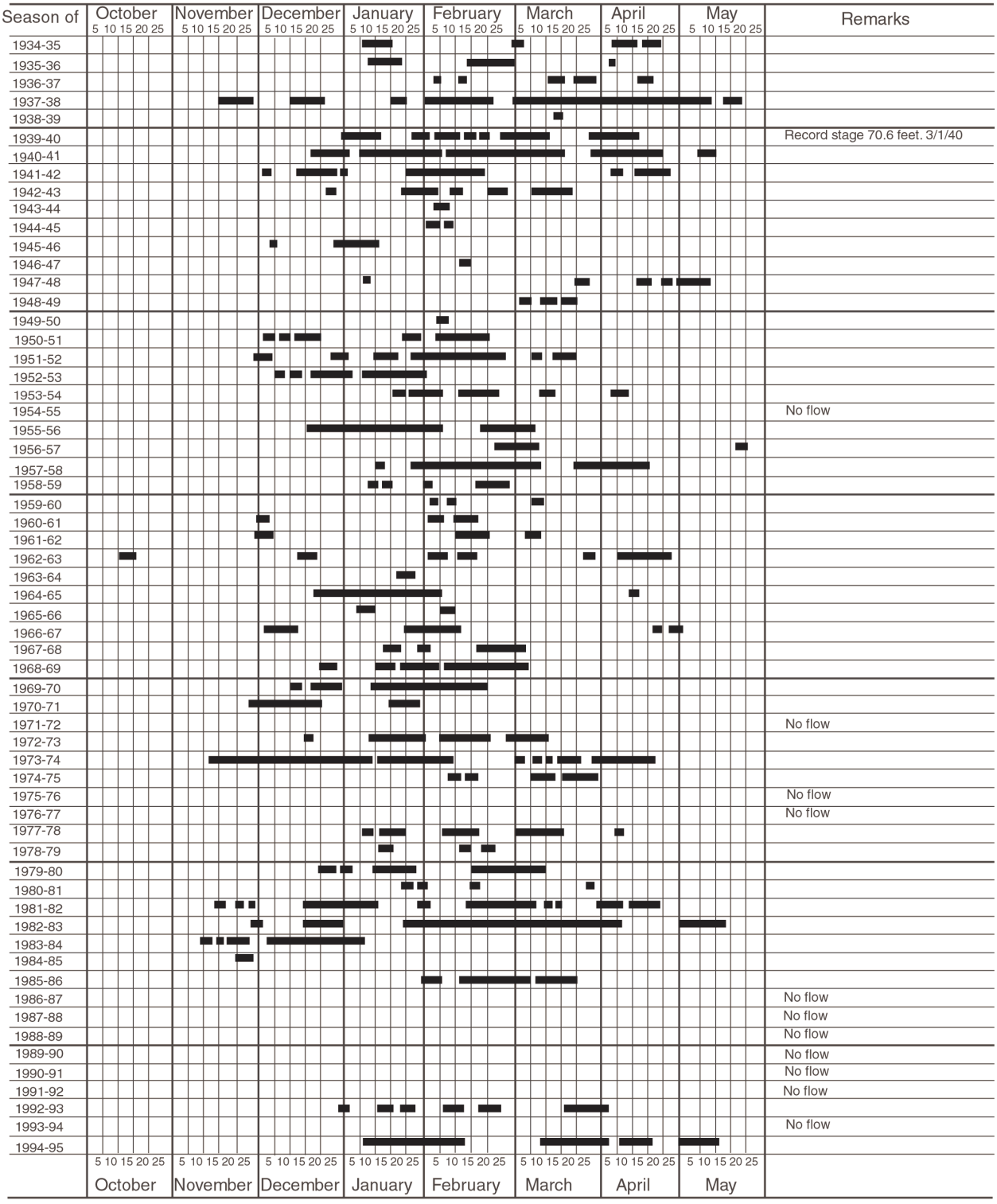
Overflow records for Moulton, Colusa, Tisdale, Fremont, and Sacramento Weirs from 1934 through 1995 are found on the following pages. Subsequent years will be added as the charts are updated.

Moulton Weir Overflow Period of Record



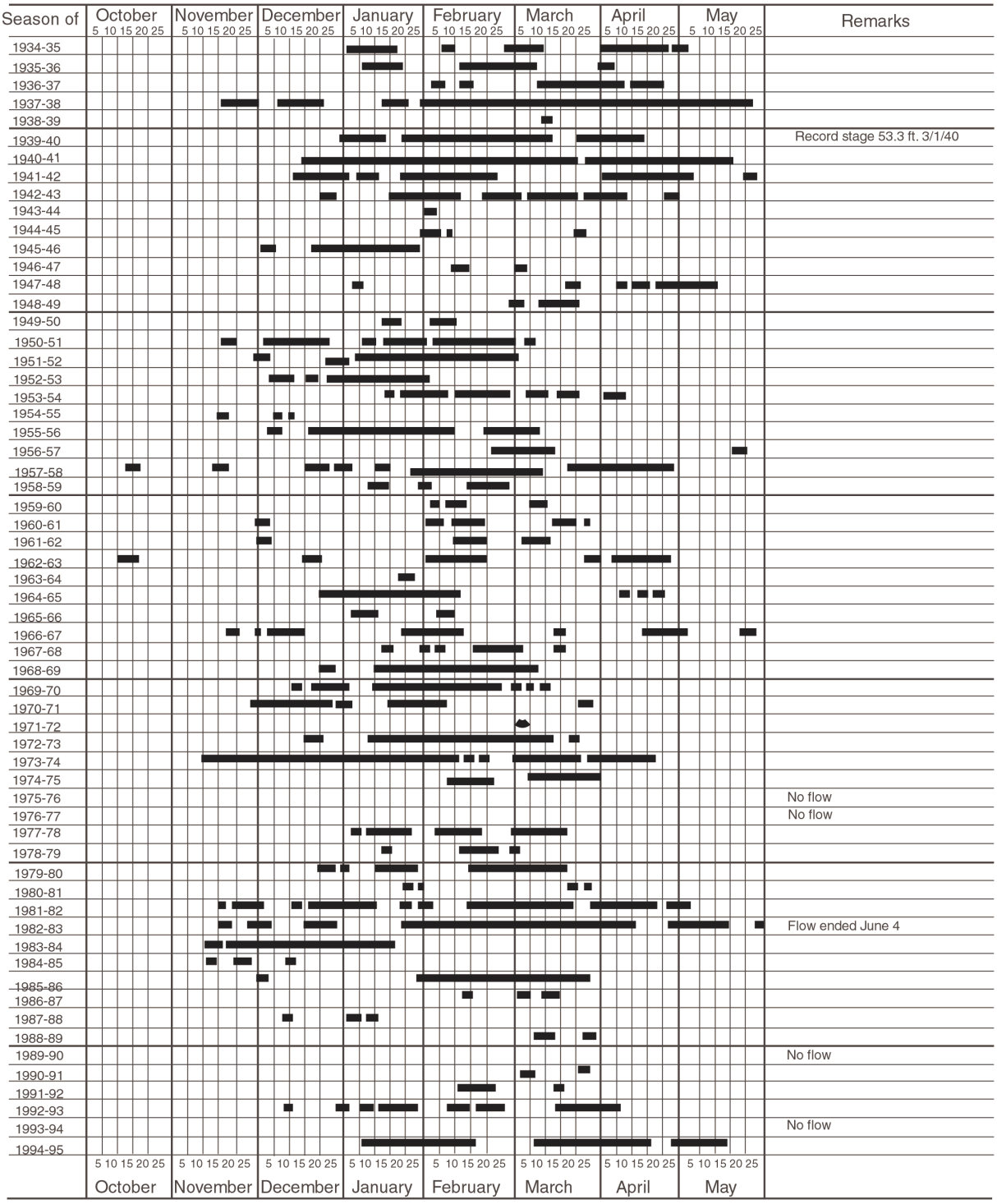
Note: Data compiled from records of DWR stream gaging station, Sacramento River at Moulton Weir
Datum: 0=0' U.S.E.D. Period of Record: 1935 to 1995 Crest elevation: 76.75 feet
Designates period of flow over weir

Colusa Weir Overflow Period of Record



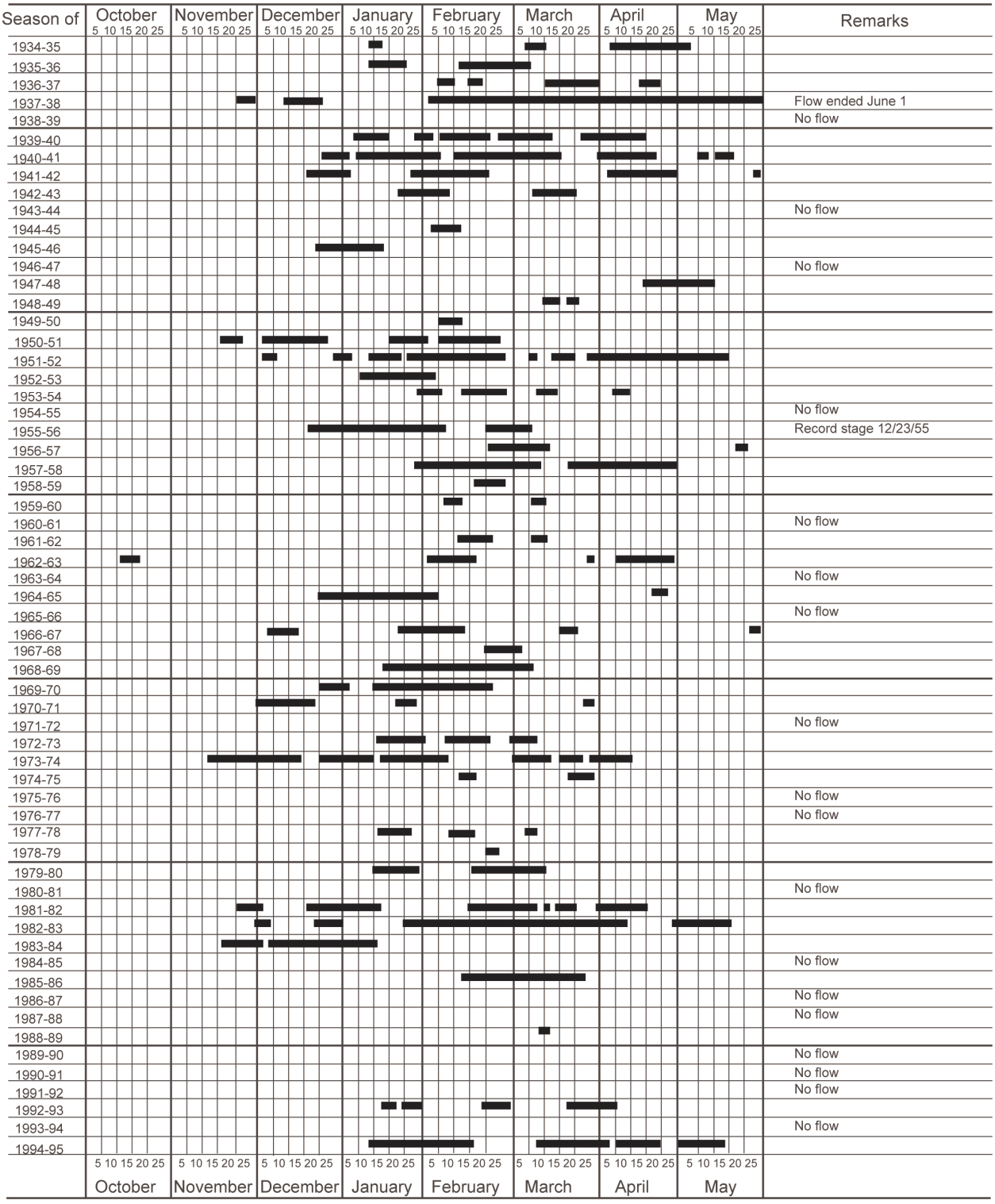
Note: Data compiled from records of DWR stream gaging station, Sacramento River at Colusa Weir
Datum: 0=0' U.S.E.D. Period of Record: 1935 to 1995 Crest elevation: 61.80 feet
Designates period of flow over weir

Tisdale Weir Overflow Period of Record



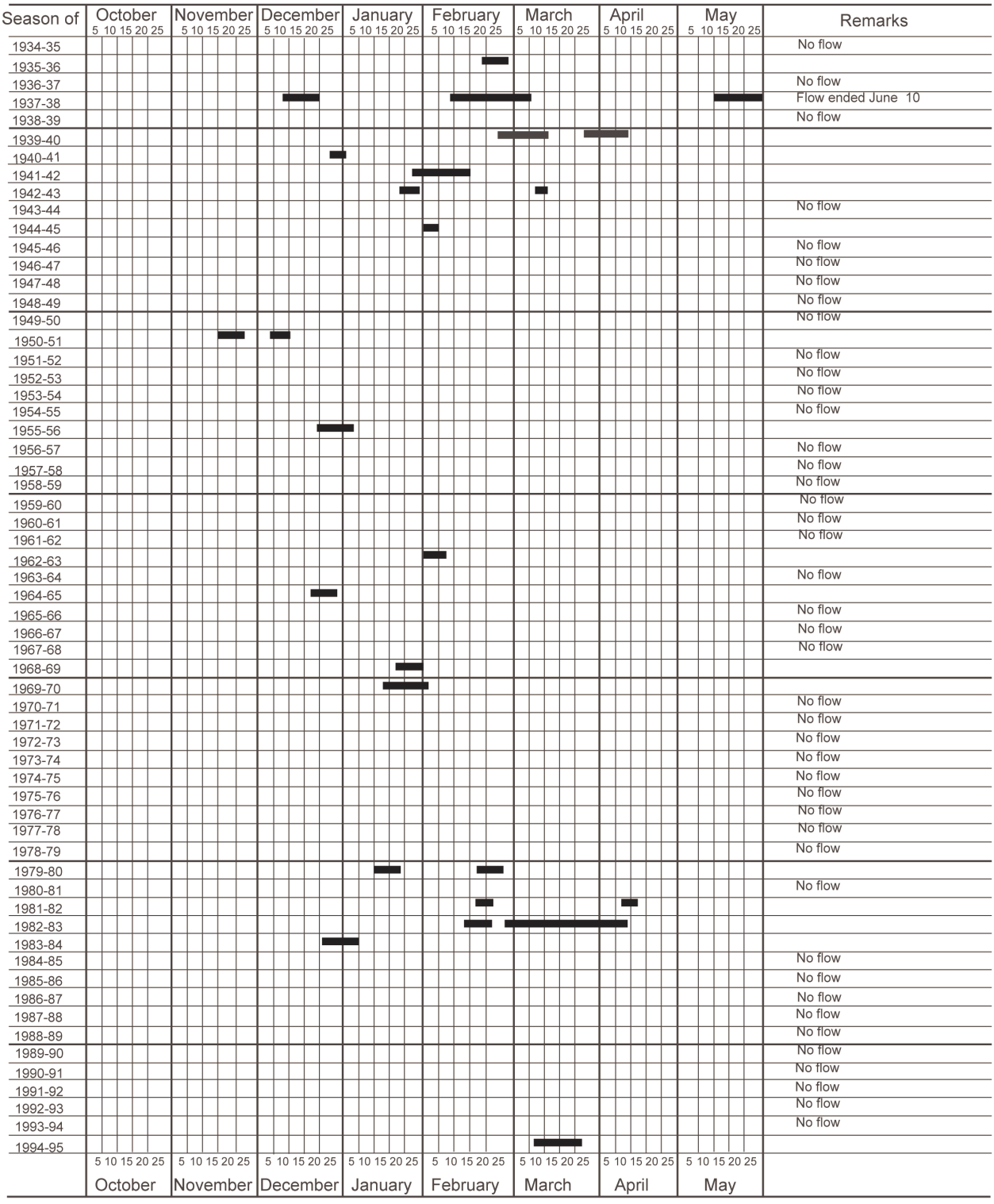
Note: Data compiled from records of DWR stream gaging station, Sacramento River at Tisdale Weir
Datum: 0=0' U.S.E.D. Period of Record: 1935 to 1995 Crest elevation: 45.45 feet
Designates period of flow over weir

Fremont Weir Overflow Period of Record



Note: Data compiled from records of DWR stream gaging station, Sacramento River at Fremont Weir, West End
Datum: 0=0' U.S.E.D. Period of Record: 1935 to 1995 Crest elevation: 33.50 feet
Designates period of flow over weir

Sacramento Weir Overflow Period of Record



Note: Data compiled from records of DWR stream gaging station, Sacramento Weir Spill to Yolo Bypass, near Sacramento
Datum: 0=0' U.S.E.D. Period of Record: 1935 to 1995 Crest elevation: 24.75 feet Elevation of top of gates: 31.0 feet
Designates period of flow over weir